

[00030] Figure 12 illustrates the data structure of the history database of Figure 2.

[00031] Figure 13 is a flow diagram illustrating the steps performed by the form field compare engine of Figure 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

INTRODUCTION

[00032] The present invention, in its preferred embodiment, is an artificial intelligence form fill software system (or program, or set of related programs) 100 that speeds up and simplifies the process of completing on-line forms, including forms from merchants that are necessary when buying goods and services on a wide area network such as the Internet. The invention enables users to fill in data forms quickly and efficiently on commercial sites all over the Internet. The invention eliminates the necessity of manually establishing a directory of merchant forms. By incorporating a rule-based expert system, the invention can complete payment forms from thousands of merchant's sites. The preferred embodiment of the invention, referred to herein as the "form fill software system 100" (also known as the "WIPPIR Technology" system), is different from other form-fill applications because it can fill forms from both known sites and completely new sites, making intelligent guesses about the meaning of each data field based on existing information.

[00033] The form fill software system 100 platform is an integrated, end-to-end support for automated form filling. The form fill software system 100 works in a similar way on both wireless and regular Internet because it is independent of the transport layer and the file format.

[00034] The first module spiders web sites and brings the HTML/WML files into a central repository. The module then indexes the whole repository and produces an index that measures the relative importance of a site. The relative importance of a site is based upon the number of other sites that refer to that site. For example, if the whole index has 20,000 sites, then a site that is referred to by 4,000 other sites is more important than a site that is referred to by only 250 other sites. If two sites have the same number of references (for example only one for each of them), then the most important site is the one that is referred to by a site with a bigger relative importance, i.e., number of references.

[00035] All forms 126, especially forms requesting payment information, are isolated from the general Internet pages. The forms 126 are indexed in a "dictionary" 1000 (Fig. 10) database (alternatively called the WIPPIR dictionary") for later use in automated form filling. The dictionary 1000 allows the forms 126 to have a default form structure and name while still being able to use derivatives or variants of the default. The dictionary 126 incorporates a

series of names associated with certain form components that are then used to populate the merchant payment forms 126. An example would be a list of different terms used when a merchant is looking for a buyer's last name, such as "Last name:" or "Last name". The dictionary 1000 structure permits the treatment of non-English languages as English variants (as opposed to building the same system as a whole for a foreign language). The benefits of such treatment include faster development, cheaper and more secure maintenance, and faster day-to-day operation.

[00036] Data flow monitor 300 software (also called "WIPPIR client" software) will be installed at either the WAP Gateway or HTTP Proxy level (data flow monitor 300a) or at the device operating system (or mobile phone with operating system) level (data flow monitor 300b). Where the software is installed depends upon whether the device (PC 110 or wireless telephone or P.D.A. 106) has an independent operating system 112. It is also possible to have the data flow monitor 200 be an applet that is installed partially on the device 106 or 110 and partially on the server that contains the proxy and gateway 116 or 122 or on some other convenient server. The data flow monitor 300 (or client) software intercepts all data flows and scans for forms. When this client software identifies a payment form that needs to be filled in, it transmits the personal information (or user details) to a form fill system (or program) 200 (also called the "WIPPIR Server") together with the form 126 to be filled. The form fill system 200 then attempts to fill the merchant payment form 126 or authentication information form with the appropriate personal information (or details) that are provided by a wallet database 1100.

[00037] The form fill system 200 first tries to fill the form 126 by comparing field names of the form 126 ("NAME," "CARD," etc.) with its dictionary 1000 list of field names ("Name:", etc. in Fig. 10). If the form 126 is not fully completed in this first step, the form fill system 200 tries to guess how to fill the form 126 data fields that remained unfilled from the previous attempt by using a rule-based expert system with fuzzy logic 248. This part of the form fill system 200 is referred to as the expert system (or "WIPPIR Expert System"). It can be implemented using fuzzy logic or artificial intelligence components that perform in a manner similar to fuzzy logic. Fuzzy logic is a term defining systems able to make decisions in situations where more outcomes are possible, as opposed to the normal yes/no algorithmic logic implemented in most typical systems. Normal systems have a finite number of possible states, described entirely by the initial program. Fuzzy logic systems can make decisions in unpredicted situations, and are capable of learning and improving their algorithms and

results. Based on this approach, such systems are widely used in form/speech recognition, expert systems, and all forms of artificial intelligence.

[00038] If the dictionary 1000 and the fuzzy logic 248 or other expert system (or "WIPPIR expert") are unable to complete all entries on the form 126, then the form fill system 200 tries to look into its history database 1200 to see if in the past that specific site 104 and form 126 had been form filled by a human person (not by a machine). If so, then the system 100 can extract the rules 1002 (Fig. 10) for filling in the form 126. If not, the person trying to perform the transaction will eventually have to manually input the data. The data flow monitor 300 intercepts what the user fills in and sends it to the form fill system 200, which will write it to a history database 1200 for future use. Following completion of the form 126, the form is returned to the merchant for processing.

[00039] The history system (history unit 230, history database 1200, etc.) is notified to start the search process at the same time as the automatic rule-based system (automatic filler 218, rules engine 220, dictionary 1000, fuzzy logic 248, etc.) is notified to start. The history search is initiated simultaneously because of the size of the history database 1200 relative to the rules dictionary 1000. The size of the history database 1200 means that it will likely take much longer to search for entries there compared to searching for rules in the rules dictionary 1000. However, because the system 100 is designed to be a continuous process, if the history database 1200 returns form information prior to the automatic filler 218 or fuzzy logic 248 components, then the history information is added to the form 126.

SYSTEM OVERVIEW

[00040] With reference to Figure 1, an overview block diagram of a preferred form of a secure Internet based form filling system 100 is shown. The system 100 is built to work with the Internet 102 wide area network which interconnects numerous vendor and other web sites. A typical vendor web site 104 is shown in Figure 1. Individuals wishing to gain access to the Internet and to the vendor's web sites may do so using wireless telephones or PDAs 106 containing a browser 108 built in. In addition, they may gain access using a PC 110 having an operating system 112 such as Microsoft's Windows ME or Apple's OS X and also having a Microsoft Explorer, Netscape Navigator or similar Internet browser 114. The wireless telephone or personal digital assistant 106 may also contain an operating system, in which case its block diagram would appear similar to that of the user's PC 110. However, many wireless telephone accessories contain only programs in read only memory (ROM) and do not have an operating system to which Internet applets can be attached.